

## **Rocky Flats Citizens Advisory Board Recommendation 95-8**

**to the Department of Energy**

### **Plutonium at Rocky Flats: A Framework for Decision-Making**

**Approved September 7, 1995**

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#### **Introduction**

Rocky Flats began operation in the early 1950s as part of the United States nuclear weapons production complex. For close to forty years, the primary mission at Rocky Flats was the fabrication of the plutonium pit, or trigger device, for nuclear warheads. This mission continued until 1989 when the Department of Energy suspended production activities at Rocky Flats in order to correct safety and other problems at the aging facility. At that time, the management at Rocky Flats began a mission of upgrading the plant so that weapons production could continue. For the next several years work continued on these upgrades. During this same period of time, world events changed dramatically, leading to the end of the Cold War. For Rocky Flats, the impact of these changes culminated in an announcement by then-President George Bush in 1992 that the weapons production mission for the facility had ended. In 1994, the name of the facility was changed to the Rocky Flats Environmental Technology Site and a new cleanup mission began.

With the new mission come many challenges, including environmental restoration, waste management, and activities related to the disposition of plutonium. Of these areas, perhaps the biggest challenge is what to do with the 14.2 tons of plutonium, plus the additional amount held up in process drains, piping and ventilation systems, that remain at Rocky Flats. The plutonium is in the form of raw material metal, finished product, oxides, residues, and waste. Compounding this problem is the fact that Rocky Flats was never designed as a long-term plutonium storage facility. In the past, plutonium came in as feed material - raw metal, scraps, and retired pits - and left as a finished pit. A further complicating factor is that when production activities were halted in 1989, the process lines at the facility came to an abrupt halt. The anticipation at that time was that production would restart in only a short period of time. Unfortunately that short time period turned into several years, leaving materials in configurations never designed or suited for extended storage.

Today, Rocky Flats faces numerous problems caused by the abrupt suspension of production and several years of focus on restart, with consequent neglect of stored plutonium. In 1994, the Department of

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Energy began a survey of its weapons complex sites to identify where they were vulnerable in terms of threats to the health and safety of workers, the public, and the environment. For Rocky Flats, the results of this survey showed that indeed vulnerabilities do exist in the form of facilities that are old and in need of major repair and upgrading, plutonium-bearing liquids stored in tanks where there is a danger of leaking, plutonium oxides that present a fire danger, and storage containers that have a build-up of explosive hydrogen gas. Currently the Department of Energy is developing corrective actions to address these vulnerabilities.

One of the questions now facing the Department is where and how to store the plutonium, in its many forms, while it remains at Rocky Flats. This spring, DOE offered a plan to repackage all of the material into new containers, called the 50-year can, and move it into Building 371. Since that time, questions have arisen from the public regarding the wisdom of that decision. Public concerns include, but are not limited to, the dangers from explosions, multiple coincident events and terrorism, plus the multitude of threats to worker health and safety. In addition, the Defense Nuclear Facilities Safety Board, a Congressionally-mandated watchdog of the Department of Energy's weapons complex sites, issued a finding that Building 371 may not be capable of protecting the contained plutonium in event of an earthquake. Faced with these issues, the Department must now make a decision on what it plans to do. Does it continue forward with its consolidation plans for Building 371? What upgrades will it fund to provide greater protection in the event of an earthquake? Would it be better to start from scratch and build a new facility for storage? Are there other alternatives?

## **The Role of the Rocky Flats Citizens Advisory Board**

The Citizens Advisory Board (CAB) was created in 1993 to provide advice and recommendations to the Department of Energy and the regulators who have oversight at Rocky Flats. CAB members represent a broad spectrum of local interests including environmentalists, site workers, academicians, local government officials, peace activists, health care professionals and others. These members strive to inform themselves about the issues and then arrive at consensus opinions. Work within the CAB is accomplished by separate committees, including a Plutonium and Special Nuclear Materials Committee. Each committee is currently working on what are known as the broad, "big picture" issues. The Plutonium and Special Nuclear Materials Committee is working on all issues related to the plutonium on site and as such, the committee members are carefully examining both the corrective actions necessary to correct the aforementioned vulnerabilities and the broader question of the ultimate fate of the plutonium stored at Rocky Flats.

The Citizens Advisory Board understands that DOE will make a decision in December 1995 regarding what actions it will take in response to the recent recommendation by the Defense Nuclear Facilities Safety Board regarding the capability of Building 371 to provide protection in the event of an earthquake. In its most recent deliberations, CAB identified a range of options for consolidation of plutonium at Rocky Flats, but given the short time period in which the Department is likely to make a decision, is not able at this time to provide a consensus recommendation as to which option is preferable. A major factor in not having consensus is that CAB does not have adequate information to answer its

many questions nor to make an informed recommendation. To remedy this situation and provide some meaningful guidance to the Department of Energy as it makes its decision regarding the fate of Building 371, CAB presents the following decision-making framework outlining common beliefs and values concerning plutonium at Rocky Flats, a list of possible alternatives that CAB would like to see considered, and a set of evaluation criteria to be used in making the decision. It is CAB's hope that DOE will use these lists and develop a matrix that will enable it to justify and explain whatever decision is made in the coming months concerning the ultimate fate of the vast stores of plutonium at Rocky Flats.

## **Core Values and Beliefs Associated with Plutonium at Rocky Flats**

The Rocky Flats Citizens Advisory Board has identified the following core values and beliefs by which it will evaluate any decisions or actions related to the treatment, storage, and ultimate disposition of plutonium at the site.

- Plutonium must be in the safest storage possible while at Rocky Flats.
- Plutonium must be removed at the earliest possible date from Rocky Flats and the Denver metropolitan area.
- Reality dictates that plutonium will be at Rocky Flats for "some" interim time period.
- Actions involving plutonium at Rocky Flats must be designed to minimize handling to provide as low as reasonably achievable exposure to workers. Correcting plutonium hazards will expose Rocky Flats workers to health and safety problems. The workers must be provided with an outside agency to which they can appeal for correction or mitigation of health and safety concerns.
- Actions taken in the near term must be in concert with disposition and be consistent with United States non-proliferation goals.

## **A Time Frame for Decision-Making and Action**

As one looks down the road from where Rocky Flats is today in terms of plutonium storage and associated problems, to where the community views the ultimate fate of the material away from the Denver area, the following three time periods emerge. It is important that work proceed consistently across these three phases in order to meet the core values as described above, especially to provide maximum safety, to minimize handling and worker exposure, and to align with ultimate disposition and non-proliferation strategies.

- **The Corrective Action Phase:** This is the phase Rocky Flats is currently in and will extend to the point when all vulnerabilities associated with plutonium are corrected. During this time period, work will commence to treat or otherwise handle materials to allow them to go into interim storage in the safest possible manner. It is essential that the Department of Energy begin planning for the ultimate disposition of plutonium when it is no longer at Rocky Flats so that actions taken during this corrective action phase are consistent with this ultimate fate.
- **The Interim Storage Phase:** During this time period all corrective actions will be complete and

the materials will be stored in a safe configuration while preparations are being made for ultimate disposition. While the CAB members have widely divergent opinions on how long interim storage should or could last, there is strong consensus that provisions be made to provide the safest possible storage configuration. During this time period there must be a serious effort made by the Department to develop an acceptable option for ultimate disposition that will see the material move away from Rocky Flats.

- **The Ultimate Disposition Phase:** Beginning with planning during the corrective action phase and with work in progress during the interim storage phase, eventually plutonium will leave the Rocky Flats site. When materials actually begin movement this third and final phase will begin. It will end when the entire inventory of plutonium has left the site. As with the other three phases, it is important that the Department of Energy keep in mind the core values and beliefs to ensure a safe transfer of the materials from Rocky Flats and to assure an ultimate fate that will not in itself create a problem for a different part of the country.

## Options and Decision-Making Criteria

### Macro Storage

**Macro Storage Options:** Macro storage is defined as the actual physical location or configuration in which large numbers of containers of plutonium are accumulated for interim storage before a final disposition option is ready. The following options represent the possibilities identified by members of CAB and are not meant to be exclusive. There likely may be alternatives which the Department would add to this list.

- **Use Building 371 as is:** Storage of plutonium in Building 371 would proceed following DOE Order 3013 without any major seismic upgrades.
- **Remodel Building 371:** To conform with Defense Nuclear Facilities Safety Board concerns expressed in Recommendation 94-3, seismic and other upgrades would have to be accomplished in this building before materials could be consolidated into it.
- **Build a New Facility On-Site:** A new building could be built that would be state of the art and used initially for the sole purpose of storing plutonium; once the plutonium is removed the building could be used for storage of other waste long-term in monitored, retrievable form.
- **Build or Retrofit a New Facility Off-Site:** The Department might decide to move materials off-site for interim storage. Possibilities include using existing DOE facilities, constructing a new facility, or remodeling and utilizing former missile silos.
- **Build a Better Container:** A related possibility is that the Department should not worry so much about the facility, but should concentrate on building a "super container" that would provide maximum protection for the material regardless of the facility in which it was put.

**Macro Storage Decision-Making Criteria:** The following list of criteria are offered as key components that need to be considered by the Department in making a decision. As with the options, the list is not meant to be exclusive. CAB offers these criteria as being important information needs to help it make a

decision and evaluate whatever option the Department selects.

- **Cost:** What is the anticipated cost of infrastructure, transportation, and monitoring of the storage facility? Must include cost for construction and/or renovation as well as operating and maintenance cost of the facility; also, what costs (e.g., contamination and cleanup) will emerge down the line?
- **Time:** How soon will the facility be ready? How long will it take to complete transfer of the materials into the facility? What will be the useful life of the facility?
- **Congruence with ultimate disposition:** Does the alternative permit a smooth transition to and is it consistent with the ultimate disposition for plutonium?
- **Risks to workers:** Does the alternative reduce the exposure to workers? Which alternative provides the greatest reduction?
- **Safety from foreseeable dangers** -- e.g., earthquake, flood, tornado, maximum credible internal accident, airplane crash, terrorist attack.
- **Non-proliferation:** Which option makes plutonium least accessible to diversion or theft?
- **Engineering feasibility:** Is the alternative realistic? Is one alternative more readily achievable than the others?
- **Security:** Does the alternative support the security needs for protection of the materials?
- **Uncertainty:** Are there any major roadblocks that could develop and stop progress on the alternative?
- **Environmental Impact:** Any chosen alternative should be as protective to the environment as possible including air, soil, and water pathways.

## Micro Storage

**Micro Storage Options:** Micro storage is defined as the actual physical container or form in which individual pieces or quantities of plutonium will be encased. As above, the list of options is not meant to be exclusive.

- **The 50-Year Can:** Currently the Department is pursuing development of a new plutonium storage container that will be double-walled, 16 gauge-stainless steel to conform with DOE Standard 3013-94, Criteria for Safe Storage of Plutonium Metals and Oxides.
- **Vitrification:** Another possibility is for the Department to encapsulate the plutonium and seal it in glass logs through the process known as vitrification. A pilot plant would be built at Rocky Flats for this purpose. This option would preclude the use of the 50-year can.
- **Build a Better Container:** A related possibility is that the Department should not worry so much about the facility, but should concentrate on building a "super container" that would provide maximum protection for the material regardless of the facility in which it was put.

**Micro Storage Decision-Making Criteria:** As described above, these criteria should be analyzed and information presented to support decision-making.

- **Cost:** What is the anticipated cost of design and implementation of the alternative?
- **Time:** How soon could the alternative be available? How long before all the material is stored in the "micro container"? Congruence with ultimate disposition: Does the alternative permit a smooth transition to and is it consistent with the ultimate disposition for plutonium?
- **Risks to workers:** Does the alternative reduce or increase the exposure to workers? Which alternative provides the greatest reduction?
- **Safety from foreseeable dangers** -- e.g., earthquake, flood, tornado, maximum credible internal accident, airplane crash, terrorist attack.
- **Non-proliferation:** Which option makes plutonium least accessible to diversion or theft?
- **Engineering feasibility:** Is the alternative realistic? Is one alternative more readily achievable than the other?
- **Security:** Does the alternative support the security needs for protection of the materials?
- **Uncertainty:** Are there any major roadblocks that could develop and stop progress on the alternative?
- **Dispersal:** Which option provides the greatest protection against dispersal of the plutonium in the event of a major accident?
- **Environmental Impact:** Any chosen alternative should be as protective to the environment as possible including air, soil, and water pathways.

## Future Disposition

**Future Disposition Options:** Eventually plutonium will be removed from Rocky Flats. Currently, the following two options are being considered by the Department and others.

- **Vitrification:** Vitrification allows the plutonium to be bound up within glass, a form many believe would allow for safer storage not only while the material remains at Rocky Flats, but also when it is shipped to a national repository. Materials could be added during vitrification that would make extraction and reuse more difficult.
- **Mixed Oxide Reactor Fuel:** Another alternative included in the national debate is the possibility of using the plutonium as part of a fuel mixture for consumption in a nuclear reactor.
- **Other options:** The Department should investigate other options for inclusion with the above two.

**Future Disposition Decision-Making Criteria:** The following criteria are judged important for consideration of the ultimate fate of plutonium in a national strategy.

- **Congruence with U.S. Disposition Policy:** The DOE and President Clinton stated in 1993 that the disposition of plutonium should take into account the U.S. policy of nuclear nonproliferation.
- **Enhances safety at Rocky Flats:** The option selected should improve the safety of the Rocky Flats plutonium to prevent its dispersal by air or by leaching into soil or groundwater, and should lessen the long-term post-stabilization handling of the plutonium.
- **Time:** The option selected should get the plutonium into the safest form in the least time in order

to address the above nonproliferation and safety considerations.

- **Cost:** The option selected should be realistic from a cost standpoint.
- **Engineering Feasibility:** Does the technology exist to carry out the option? Is it feasible to develop the technology in a timely manner?
- **Security:** Does the option put the plutonium in a form that makes it hard to divert or steal? Is it vulnerable to a terrorist attack?
- **Does it meet the spent fuel standard?:** The plutonium should be as hard to extract as it would be from spent fuel.

## In Closing

Decisions that the Department of Energy makes in the near-term will have great impact on the course of action for the future. It would be unfortunate for DOE to embark on a course of action today that would eventually have to be altered at the expense of both time and taxpayer dollars. It is likely that no single course of action alone will suffice, but that a combination of the above alternatives may prove most beneficial in providing safe and cost-effective handling, storage, and disposition of plutonium. CAB encourages both DOE and the Defense Nuclear Facilities Safety Board to carefully consider the impact that a near-term course of action will have on the ultimate disposition of the plutonium stored at Rocky Flats. Although it is critical that actions to correct vulnerabilities and to develop the safest possible interim storage proceed as quickly as possible, time for careful planning is a necessary part of the process. It is the desire of the Citizens Advisory Board that work progresses and that wise decisions are made regarding the fate of plutonium. The information developed to support the decision-making criteria as outlined in this paper is vital for public understanding and confidence in the final course of action selected by DOE.

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The Rocky Flats Citizens Advisory Board is a community advisory group that reviews and provides recommendations on cleanup plans for Rocky Flats, a former nuclear weapons plant outside of Denver, Colorado.

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